

ABSTRACT

An improved gain-clamped optical amplifier is disclosed. A series of laser cavities are placed along the amplifier axis. The laser cavities are designed such that the carrier densities of the amplifier decline toward the signal output end. Since the gain clamping amplitudes at positions along the amplifier can be different, we have the freedom to optimize the optical gain at all location, to minimize the noise impact at the signal input end, and to maximize the saturation output power at the signal output end. In addition, carrier leveraging effect realized by gain/loss wings further lowers the noise figure, and extends the optical gain and saturation output power. An ideal optical amplifier with high linear gain, small noise figure, and large saturation output power and extended dynamic range is then achieved. Energy saving is the bonus of using the invented amplifiers.